FACE INVESTIGATION

SUBJECT: Youth Camp Counselor Dies of Carbon Monoxide Poisoning

SUMMARY: A 15-year-old male camp counselor (the victim) died of carbon monoxide poisoning when the furnace malfunctioned in the cabin where he was sleeping. The victim had worked as a counselor at the camp for nine weeks, then planned to stay an extra week after the camp closed in late summer to assist with clean-up. On the night of the incident, he was the only person assigned to sleep in the building that housed the health services. The wood frame building had an furnace room which housed an LP gas fueled furnace and LP gas fueled water heater (Figure 1). The water heater was used continuously throughout the summer, while the furnace was only used infrequently and for brief time periods. There were no records to indicate when the furnace and water heater had been inspected or repaired. Smoke detectors were located on two opposite ends of the building, which held sleeping quarters for four people. There were no carbon monoxide detectors in the building. The victim went to the building about 8:30 p.m. the eve of the incident, and turned on the furnace before he went to bed. He kept the windows and doors closed. When the victim didn't show up for breakfast the next morning, a supervisor went to the building and found him motionless in bed. Emergency services were summoned, and EMS arrived at the scene within 25 minutes. The first responders found no signs of life in the victim, then exited the building until the sheriff arrived. The sheriff viewed the scene and determined there were no signs of foul play. The coroner was called to the scene, and pronounced the victim dead. The FACE investigator concluded that, to prevent similar occurrences, employers should:

Figure 1. View of Furnace Room

- **ensure that gas fueled appliances are installed and maintained to prevent production and buildup of carbon monoxide.**
- **ensure gas fueled appliances are inspected on a schedule recommended by the manufacturers by knowledgeable technicians with authority to make changes.**
- **install carbon monoxide detectors in buildings with gas fueled appliances.**

Additionally, emergency workers who respond to the scene of an unexplained death should**:**

- **be trained in the hazards of an asphyxiating environment and methods to protect themselves during rescue and recovery efforts.**

INTRODUCTION:
On August 22, 2000, a 15-year-old male camp counselor died of carbon monoxide poisoning when a furnace malfunctioned while he slept in a camp building. The Wisconsin FACE field investigator learned of the incident from OSHA on August 25, 2000. On August 31, 2000, the field investigator visited the scene and interviewed the camp director. The FACE investigator also reviewed the death certificate, the report of the state recreational camp inspection office, and the coroner, sheriff's and state climatologist's reports. Interviews were conducted with child labor officials from the state where the incident occurred.

The employer was an out-of-state scout council that had been in existence for about 90 years, and usually employed about 100 people. The council owned and operated the summer camp for 50 years in the state where the incident occurred. The camp was situated on 2500 acres in a wooded area, about ten miles from the nearest town. A camp road led about one mile from the county road to the camp administration center. Most of the permanent camp buildings were constructed of logs or wood frames, and were closed down when the summer camping season ended. The permanent buildings included a lodge that had administrative offices and sleeping quarters for staff. Tent camping sites were located in small groups around the camp. During the 9-week camping season, about 700 youth campers would reside at the camp each week, using their own tents.

Camp staffing was arranged by the council. The camp director and supervisors were year-round employees of the council, while seasonal workers were hired during the summer camping season. Fourteen workers, including the camp director, were at the camp at the time of the incident. The victim was a resident of the state where the council was based. He was an Eagle Scout, and had been on the camp staff the previous summer as a counselor-in-training. He was hired as a junior counselor at the camp for the summer season, and agreed to stay one week after the camp closed to assist with the activities to close the camp for the season. He was the only youth employee at that time. The camp had a copy of a valid work permit for the victim. The work activity that he had performed during the camping season and at the time of the incident were within state and federal child labor guidelines.

INVESTIGATION:
This incident occurred in a 50-year-old health services building which was located about one-fourth mile from the central lodge. It contained an office, a treatment room, sleeping quarters for four people, and a utility room. Throughout the summer, health services staff and ill or injured campers slept in the building on a regular basis. The wood frame building had an interior furnace room which housed a 25-year-old LP gas fueled furnace and an LP gas water heater. Neither appliance had a source of outside air for combustion purposes, nor was there a source of outside air for air exchange to the occupied areas. The furnace thermostat would not shut off the furnace when the desired temperature was reached, so camp staff routinely used a toggle switch on the office wall to turn the furnace on and off as needed. There were no records to indicate when the furnace and water heater had been inspected or repaired. The building lacked carbon monoxide detectors.

The victim and another staff person slept in the building the night before the incident, and used the furnace for a brief time with no known problems. On the night of the incident, the victim was the only person assigned to sleep in the health services building. He went to the building about 8:30 p.m., and chose a sleeping area which shared a wall with the rear of the furnace room. The weather service recorded a low temperature of 59E F for that evening. The victim kept the windows and doors closed when he went to bed. He apparently used the toggle switch to turn the furnace on, and went to sleep. When the victim didn't show up for breakfast the next morning, a supervisor went to the building and found him motionless in bed. Emergency services were summoned, and EMS arrived at the scene within 25 minutes. The first responders found no signs of life in the victim, then exited the building until the sheriff arrived. The sheriff viewed the scene and determined there were no signs of foul play. The coroner was called to the scene, and pronounced the victim dead.

CAUSE OF DEATH: The coroner's report listed the cause of death as carbon monoxide poisoning.

RECOMMENDATIONS/DISCUSSION

Recommendation #1:. Employers should ensure that gas fueled appliances are installed and maintained to prevent production and buildup of carbon monoxide.
Discussion: Gas fueled appliances produce carbon monoxide (CO) as a waste product of incomplete combustion of organic material. The concentration of the odorless, colorless and tasteless gas can reach hazardous levels if it accumulates in an area lacking sufficient ventilation. In this case, the gas fueled furnace and water heater were installed without provision for outside combustion air and the building lacked ventilation for make-up air whenever the doors and windows were closed. On the night of the incident, the victim kept the windows and doors closed, allowing the CO to accumulate to a deadly level while he slept.

Recommendation #2: Employers should ensure gas fueled appliances are inspected on a schedule recommended by the manufacturers by knowledgeable technicians with authority to make changes.
Discussion: There was no set schedule for inspection of the furnace and water heater at the camp, nor were records available to indicate when the appliances were last inspected. Inspection of the heating systems by a heating and ventilation specialist would have detected the lack of design for combustion and make-up air, and the wiring design that used a wall switch to turn the furnace on and off. If these situations had been corrected, the incident might have been prevented.

Recommendation #3: Employers should install carbon monoxide detectors in buildings with gas fueled appliances.
Discussion: Carbon monoxide detectors will sound an alarm when exposure to CO reaches potentially hazardous levels over a period of time. The alarm will sound after exposure to a low CO concentration over several hours, as well as exposure to high CO levels for a few minutes. There were no carbon monoxide detectors in the building where the incident occurred.

Recommendation #4: Emergency responders should be trained in the hazards of an asphyxiating

environment and be equipped to protect themselves during rescue and recovery efforts.
Discussion: Police officers, emergency rescue workers**,** firemen, and others that respond to a wide variety of emergency situations must be trained to be properly prepared for emergencies involving hazardous air environments. The agent that caused the victim to be overcome could have the same effect on any rescuer. In this case, a campground staffperson found the victim motionless in bed of an unknown cause, and called for emergency services. EMS workers entered the building, and waited outside for the sheriff after they determined there were no signs of life in the victim. The sheriff ventilated the building before allowing campground or EMS responders to re-enter.

REFERENCES

Occupational Exposure to Carbon Monoxide. U.S. Department of Health, Education, and Welfare, NIOSH, Publication HSM 73-11000, 1972.

UL 2034 - Standard for Safety for Single and Multiple Station Carbon Monoxide Alarms. Underwriters Laboratories Inc, Northbrook IL, Dec. 1997.

Worker Deaths in Confined Spaces: A Summary of Surveillance Findings and Investigative Case Reports. CDC-NIOSH, Division of Safety Research, Publication 94-103, January 1994.